

**REMARKS**

Claims 1-14, 20 and 21 stand rejected, with claims 15-19 objected to in the outstanding Official Action. Claims 1, 13-15 and 19-21 have been amended and therefore claims 1-21 remain in this application.

Attached hereto is a marked-up version of the changes made to the specification and claim(s) by the current amendment. The attached page(s) is captioned "**Version With Markings To Show Changes Made.**"

The acceptance of the drawings filed August 17, 2000 by the Examiner as noted on the Office Action Summary sheet is very much appreciated.

On page 8 of the outstanding Official Action, the Examiner indicates that claims 15-19 are objected to as being dependent upon a rejected base claim, but are indicated as otherwise being allowable if rewritten in independent form. Claim 19 as previously amended was written in independent form and therefore pursuant to the Official Action is presumed to be allowed, as there is no noted objection or rejection of this claim. Additionally, claim 15 has been amended to incorporate the subject matter of claim 1 from which it previously depended and therefore is believed to be allowed, along with claims 16-18 dependent therefrom. Notice of allowance of claims 15-19 is respectfully requested.

Additionally, independent claims 1 and 13 have been amended to recite that applicants' claimed invention provides a plurality of spatially separated images from a plurality of object planes. Specifically, the recited components are arranged and interrelated so as to accomplish the recited result. This feature is believed to clearly

distinguish the cited prior art, thereby rendering independent claims 1 and 13 allowable as well as all claims dependent therefrom.

Claims 1, 4, 5, 7, 11 and 12 stand rejected as being anticipated by Kubo (U.S. Patent 5,684,762). Independent claim 1 has been amended to recite that the plurality of spatially separated images are provided from a plurality of object planes, which is clearly not the case in the Kubo reference. In fact, Kubo provides his spatially separated images from a single object plane and the whole point of the Kubo reference is to provide an autofocus system so that the optics properly track this single object plane.

As noted in applicants' invention, for example shown in Figure 10, multiple object planes (5, 6, 7) through the appropriate diffracting grating can provide the spatially separated images at B of Figure 10. The support for the disclosure of spatially separated images resulting from a plurality of object planes is not only disclosed in Figure 10, but also discussed in the last paragraph on page 14 of applicants' specification as originally filed. In Kubo, the object plane is the disk 24 and thus comprises a single object plane. Therefore, Kubo contains no disclosure of applicants' claimed embodiments and indeed, in suggesting an autofocus system for focusing on a single object plane, would appear to teach away from applicants' claimed combination of elements. Accordingly, any further rejection of amended claim 1 and claims 4, 5, 7, 11 and 12 dependent thereon is respectfully traversed.

While there is no mention of claims 20 and 21 in the first two lines of section 3, page 2 of the outstanding Official Action, there is a reference to claims 20 and 21 on pages 3 and 4, respectively. Applicants query the Examiner as to whether these claims

are rejected as being anticipated by the Kubo reference. To the extent the Examiner believes they are, the fact that claims 20 and 21 depend from believed allowable claim 1 obviates any further basis for rejection.

Claims 13 and 14 stand rejected under 35 USC §102 as anticipated by Park (U.S. Patent 5,526,336). Applicants' previous Amendment on page 10 noted that the Examiner has not indicated how or where Park teaches applicants' claimed diffraction grating. As pointed out, Park teaches a Fresnel lens 4 which has variable focal points. While this may be analogous to applicants' plurality of object fields, it does not provide images formed on applicants' claimed plurality of image planes.

Indeed, Park is directed towards focusing the plurality of object planes onto a single optical detector 11. While the Examiner refers to Figure 7 as showing two different detectors, the splitting of the image onto the two different detectors is not as a result of the optical system or the diffraction grating; it is simply the result of beam splitter 21. It is noted that between beam splitter 3 and 21 there is a collimated light beam, and thus there is no effect of the diffraction grating on the image split at beam splitter 21 onto the two different detectors 11a and 11b. Thus, the structure of Park does not meet applicants' claim 13 language requiring the specifically recited "means for detecting" which forms images on a plurality of image planes from a plurality of object planes.

Claims 2, 3 and 6 stand rejected under 35 USC §103 as unpatentable over Kubo in view of Lee (U.S. Patent 5,721,629). Inasmuch as claims 2, 3 and 6 ultimately depend from claim 1, the above comments with respect to claim 1 distinguishing over the Kubo

reference are herein incorporated by reference. It is noted that the Examiner does not allege that the Lee reference contains any teaching of the claimed optical system diffraction grating and means for detecting which are combined so as to provide images from a plurality of different object planes to spatially separated images. As a result, claims 2, 3 and 6 are believed patentable over the Kubo/Lee combination.

Additionally, there is no reason why one of ordinary skill in the art would think to combine the Kubo and Lee patents, since Kubo is directed towards an autofocus system, whereas Lee is directed towards a dual focus system.

Claim 10 stands rejected over Kubo in view of Torok (U.S. Patent 3,861,784). Inasmuch as claim 10 depends from claim 1, the above comments distinguishing claim 1 from the Kubo reference are herein incorporated by reference. There is no allegation in the rejection that Torok teaches the disclosure missing from the Kubo reference, such disclosure necessary to anticipate or render obvious the subject matter of applicants' amended claim 1. Moreover, there is no reason why one of ordinary skill in the art would think to combine Kubo which relates to an autofocus system and the Torok reference which relates to a programmable diffraction grating. Accordingly, any further rejection of claim 10 is respectfully traversed.

Claims 8 and 9 stand rejected under 35 USC §103 as unpatentable over Kubo in view of Katayama (U.S. Patent 5,453,963). Again, claim 8 ultimately depends from independent claim 1 and thus the above comments distinguishing amended claim 1 from the Kubo reference are herein incorporated by reference. The Examiner alleges that Katayama discloses a polarization sensitive diffraction grating and it would somehow be

obvious to one of ordinary skill in the art to combine the two references. Unfortunately, the Examiner has failed to provide any indication of how or why one would be motivated to combine bits and pieces of Kubo and Katayama in the manner of applicants' dependent claim 8.

Applicants' independent claim 9 does not include the plurality of object planes set out in applicants' amended claim 1, but distinguishes from the Kubo and Katayama references by reciting that the diffraction grating comprises two gratings sensitive to different polarizations and that the diffraction orders produced by the gratings are spatially separated. Thus, applicants' claim 9, to be obvious in view of Kubo and Katayama, requires some reason or motivation for one of ordinary skill in the art to combine the subject matter of Katayama with the subject matter of Kubo. The Examiner has failed to point out any motivation for such combination. As a result, there is simply no *prima facie* case of obviousness of applicants' independent claim 9 based upon the Kubo/Katayama combination.

The Examiner's discussion of the Kubo and Park references on page 8 of the Official Action is appreciated, as is the admission that "neither Kubo nor Park et al. teaches that the apparatus is adapted for producing substantially in focus images in a common image plane from a plurality of object planes." This is believed to be dispositive of the issue of applicants' amended claims 1 and 13 which now specifically recite the plurality of object planes.

The Examiner's indication of allowable subject matter in claims 15-19 is very much appreciated and applicant has amended claim 15 so as to incorporate the limitations

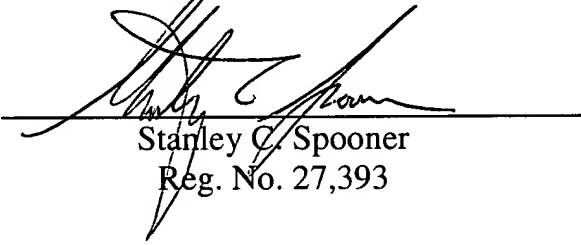
of claim 1 from which it originally depended. Therefore, claims 15-19 are believed to be allowable. Additionally, applicants' amended claims 1 and 13 reciting the "plurality of object planes" is also believed to render them patentable and all claims dependent thereon patentable. As a result, the only claim not requiring the recited plurality of object planes is claim 9, which is believed patentable because it utilizes two gratings responsive to different polarizations and there is no suggestion in the prior art for such a combination.

Having responded to all objections and rejections set forth in the outstanding Official Action, it is submitted that claims 1-21 are in condition for allowance and notice to that effect is respectfully solicited. In the event the Examiner is of the opinion that a brief telephone or personal interview will facilitate allowance of one or more of the above claims, he is respectfully requested to contact applicants' undersigned representative.

Respectfully submitted,

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**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

**IN THE CLAIMS**

1. (*Twice Amended*) An apparatus for producing simultaneously a plurality of spatially separated images from [an object field] a plurality of object planes, said apparatus comprising:

an optical system arranged to produce an image associated with a first focus condition;

a diffraction grating arranged to produce, in concert with the optical system, images associated with each diffraction order; and

means for detecting the images, wherein the optical system, diffraction grating and detecting means are located on an optical axis and the diffraction grating is located in a suitable grating plane and the diffraction grating is distorted according to a quadratic function so as to cause the images to be formed under various focus conditions from a plurality of different object planes and said images spatially separated in a direction having a non-zero component perpendicular to the optical axis.

13. (*Twice Amended*) An apparatus for producing simultaneously a plurality of spatially separated images from [an object field] a plurality of object planes, said apparatus comprising:

an optical system arranged to produce an image associated with a first focus condition;

a diffraction grating arranged to produce, in concert with the optical system,  
images associated with each diffraction order and

means for detecting the images, wherein the optical system, diffraction grating and  
detecting means are located on an optical axis and the diffraction grating is located in a  
suitable grating plane and is distorted substantially according to a quadratic function so as  
to cause the images to be formed under various focus conditions and adapted for forming  
images on a plurality of image planes, from [a single object plane] said plurality of object  
planes.

14. (Amended) The apparatus of claim 13 where at least one of the object [plane]  
planes contains a source of illumination which is used to illuminate the image planes.

15. (Amended) [The apparatus of claim 1] An apparatus for producing  
simultaneously a plurality of spatially separated images from an object field comprising:  
an optical system arranged to produce an image associated with a first focus  
condition;

a diffraction grating arranged to produce, in concert with the optical system,  
images associated with each diffraction order and

means for detecting the images, wherein the optical system, diffraction grating and  
detecting means are located on an optical axis and the diffraction grating is located in a  
suitable grating plane and the diffraction grating is distorted according to a quadratic  
function so as to cause the images to be formed under various focus conditions and said  
images spatially separated in a direction having a non-zero component perpendicular to



the optical axis, adapted for producing substantially in focus images in a common image plane, from a plurality of object planes.

19. (*Twice Amended*) An apparatus for producing simultaneously a plurality of spatially separated images from an object field comprising:

an optical system arranged to produce an image associated with a first focus condition;

a diffraction grating arranged to produce, in concert with the optical system, images associated with each diffraction order; and

means for detecting the images, wherein the optical system, diffraction grating and detecting means are located on an optical axis and the diffraction grating is located in a suitable grating plane and is distorted substantially according to a quadratic function so as to cause the images to be formed under various focus conditions and further including a dispersive system for introducing an offset to an input beam of radiation, said offset being perpendicular to the optical axis and proportional to the wavelength of the input radiation, whilst leaving the beams at each wavelength following parallel paths.

20. (*Amended*) A wavefront analyser including an apparatus for producing simultaneously a plurality of spatially separated images from [an] a plurality of object [field] fields according to claim 1.

21. (*Amended*) A passage ranging device including an apparatus for producing simultaneously a plurality of spatially separated images from [an] a plurality of object [field] fields according to claim 1.